

Claims

[c1] What is claimed is:

1. A pointing device comprising:

a housing having base plate;

a wheel module comprising:

a pedestal having a swing shaft extended there through, the pedestal capable of swinging left and right about the swing shaft, the swing shaft pivotally connected to the base plate of the housing;

a wheel installed on the pedestal and rotatable about a rotary shaft that extends from the left of the pedestal to the right and is perpendicular to the swing shaft, the wheel including a step surface having at least one concave segment and at least one convex segment on an inner circumference of the wheel; and

a step unit having a step body fixed on the pedestal and a push pad elastically connected to the step body, the push pad contacting the step surface and moving back and forth relative to the step body as a result of the push pad contacting the concave and convex segments when the wheel is rotated; and

a swing-sensing module installed on the housing for detecting the swing of the pedestal about the swing shaft

and for generating a corresponding swing-sensing signal.

[c2] 2. The pointing device of claim 1, wherein a front end of the swing shaft is vertically fixed to the base plate of the housing and a rear end of the swing shaft is vertically free to move up and down pivoting about the front end of the swing shaft, the pointing device further comprising:

a click sensor installed in the housing for detecting vertical movement of the pedestal and generating a corresponding click-sensing signal.

[c3] 3. The pointing device of claim 1 further comprising:
a rotation-sensing module installed on the pedestal for detecting the rotation of the wheel about the rotary shaft and generating a corresponding rotation-sensing signal.

[c4] 4. The pointing device of claim 3 wherein an optical gate is disposed on the wheel, the optical gate having at least one light-passing area and one light-blocking area, the rotation-sensing module further comprising:
a light emitting element installed on one side of the pedestal for emitting a light beam; and
a light receiving element installed on the other side of the pedestal, wherein when the optical gate rotates with the wheel, the light-passing areas and the light-blocking

areas alternately pass between the light emitting element and the light receiving element.

[c5] 5. The pointing device of claim 1 wherein the housing further comprises:
at least one button; and
at least one button sensor for detecting the press of the button and generating a corresponding button-sensing signal.

[c6] 6. A pointing device comprising:
a housing having base plate;
a wheel module comprising:
a pedestal having a swing shaft extended there through, the pedestal capable of swinging left and right about the swing shaft, the swing shaft pivotally connected to the base plate of the housing;
a wheel installed on the pedestal and rotatable about the rotary shaft that extends from the left of the pedestal to the right and is perpendicular to the swing shaft, the wheel including an optical gate having at least one light-passing area and one light-blocking area;
a rotation-sensing module for detecting the rotation of the wheel about the rotary shaft and generating a corresponding rotation-sensing signal, the rotation-sensing module comprising:
a light emitting element installed on one side of the

pedestal for emitting a light beam; and
a light receiving element installed on the other side of the pedestal, wherein when the optical gate rotates with the wheel, the light-passing areas and the light-blocking areas alternately pass between the light emitting element and the light receiving element; and
a swing-sensing module installed on the housing for detecting the swing of the pedestal about the swing shaft and for generating a corresponding swing-sensing signal.

[c7] 7. The pointing device of claim 6 wherein the wheel includes a step surface having at least one concave segment and at least one convex segment on an inner circumference of the wheel, the pointing device further comprising:
a step unit having a step body fixed on the pedestal and a push pad elastically connected to the step body, the push pad contacting the step surface and moving back and forth relative to the step body as a result of the push pad contacting the concave and convex segments when the wheel is rotated.

[c8] 8. The pointing device of claim 6, wherein a front end of the swing shaft is vertically fixed to the base plate of the housing and a rear end of the swing shaft is vertically free to move up and down pivoting about the front end

of the swing shaft, the pointing device further comprising:

a click sensor installed in the housing for detecting vertical movement of the pedestal and generating a corresponding click-sensing signal.

[c9] 9. The pointing device of claim 6 wherein the housing further comprises:
at least one button; and
at least one button sensor for detecting the press of the button and generating a corresponding button-sensing signal.

[c10] 10. A pointing device comprising:
a housing having base plate;
a wheel module comprising:
a pedestal having a swing shaft extended there through, the pedestal capable of swinging left and right about the swing shaft, the swing shaft pivotally connected to the base plate of the housing, wherein a front end of the swing shaft is vertically fixed to the base plate of the housing and a rear end of the swing shaft is vertically free to move up and down pivoting about the front end of the swing shaft;
a wheel installed on the pedestal and rotatable about the rotary shaft that extends from the left of the pedestal to the right and is perpendicular to the swing shaft; and

a click sensor installed in the housing for detecting vertical movement of the pedestal and generating a corresponding click-sensing signal; and
a swing-sensing module installed on the housing for detecting the swing of the pedestal about the swing shaft and for generating a corresponding swing-sensing signal.

- [c11] 11. The pointing device of claim 10 wherein the wheel includes a step surface with at least one concave segment and at least one convex segment on an inner circumference of the wheel, the pointing device further comprising:
a step unit having a step body fixed on the pedestal and a push pad elastically connected to the step body, the push pad contacting the step surface and moving back and forth relative to the step body as a result of the push pad contacting the concave and convex segments when the wheel is rotated.
- [c12] 12. The pointing device of claim 10 further comprising:
a rotation-sensing module installed on the pedestal for detecting the rotation of the wheel about the rotary shaft and generating a corresponding rotation-sensing signal.
- [c13] 13. The pointing device of claim 12 wherein an optical gate is disposed on the wheel, the optical gate having at

least one light-passing area and one light-blocking area, the rotation-sensing module further comprising:
a light emitting element installed on one side of the pedestal for emitting a light beam; and
a light receiving element installed on the other side of the pedestal, wherein when the optical gate rotates with the wheel, the light-passing areas and the light-blocking areas alternately pass between the light emitting element and the light receiving element.

[c14] 14. The pointing device of claim 10 wherein the housing further comprises:
at least one button; and
at least one button sensor for detecting the press of the button and generating a corresponding button-sensing signal.